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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Tienteh CHEN, et al.
Title:	INKJET RECORDING MATERIALS
Appl. No.:	10/613,495
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DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I, Dr. Tienteh Chen, hereby declare that:

1. I am a program manager at Hewlett-Packard Development Company, L.P, (HP) which is the assignee of the captioned application. I also am named as an inventor in this application.

2. I am an expert in the print media and recording material art, having conducted research in this field for over eight years. My research at HP has focused on the development of microporous and swellable recording materials for inkjet printing and I have developed three new products that have been commercialized by HP. I am a co-inventor on 48 US patents and 20 pending patent applications. More specific qualifications are set out in my *curriculum vitae*, which is attached hereto as APPENDIX A.

3. I have read and understand the non-final office action dated May 7, 2009, rejecting claims 1, 4, 6 and 7. For the reasons that follow I believe that the inventive print medium is not obvious to one of ordinary skill in the pertinent art.

The Prior Art

4. It is well known that photo base paper is the substrate of choice to obtain high quality images using an inkjet printer. Photo base paper is a pulp paper that is extruded on both sides with polyethylene. It is well documented that photo base paper does not readily absorb ink due to the presence of the polyethylene layer on its surface. As a result of the polyethylene layer, therefore, the gloss, image quality, and photo feel of the inkjet print media is greatly improved. Because of the impermeability of polyethylene to ink solvents, a high coatweight of the ink receiving layer, which is capable of absorbing ink and ink solvents, is necessary to prevent smearing, bleeding, mottling, and coalescence of the inkjet print. Typically, the coat weight of the ink receiving layer on a photo base paper, therefore, is in the range of **25 – 40 grams per square meter**. Furthermore, the high coat weight of the ink receiving layer helps to separate colorant from the ink vehicle in order to obtain proper coalescence of the image.

Well Known That Non-Photo Base Paper Does Not Provide High Quality Images

5. Prior to the inventive paper base print medium, non-photo base paper was not used to obtain high quality images. Although, paper base substrates are porous, paper base print medium cockle and wrinkle when used with inkjet printers. For example, photographs printed on a paper base medium wrinkle, have poor glossiness and an overall poor quality of the printed image as a result of a lower color gamut and color saturation in the printed image.

The Claimed Invention

6. It was unexpectedly discovered that the quality of print images using the claimed print medium having an ink receiving layer and an absorptive coated paper base was substantially enhanced to equal or exceeds the image quality of photo-based print media. As an expert in the print art field, I believe that the improved print image quality using the claimed print medium is due, at least in part, to the following three aspects of the inventive print medium:

(i) the presence of a thin coating of the ink receiving layer on the paper base's surface, which allows the ink vehicle to pass through and reach the absorptive paper base,

(ii) the ability of the paper base to quickly absorb the ink vehicle and dry the ink, and

(iii) the ability of the ink receiving layer, to concentrate the dye molecules on to the surface of the print medium, enhancing color gamut and K_{od} as illustrated below in Table I.

7. Concerning points (i) and (ii), the coat weight of the claimed ink receiving layer in the inventive print medium is in the range of 3 – 7 grams per square meter, significantly less than the coat weight of such a layer on a photo base paper of 25-40 grams per square meter. As mentioned above, the thin coating allows for the rapid passage of the ink vehicle and consequently rapid drying of the ink from the ink jet printer. Furthermore, the presence of one or more hydrophilic polymer(s) or water soluble polymer(s) in the ink layer improve image quality by enhancing ink absorption and by keeping together the components of the ink receiving layer.

8. The improved print quality of the claimed paper base print medium over photo base medium was measured using various indicia of image quality, such as improved permanence of image, improved light and air fastness of the image, and improved humid bleed and humid color shift of the printed image. Table I compares print images on commercially available photo base print medium to images on the inventive paper base print medium coated with a subgroup of four illustrative ink-receiving compositions (A – D). See Table 2 of the specification. As noted in applicants specification, ink receiving layers A, B, C, and D have the following compositions in which the amount of each component is expressed in parts by weight:

(A) Composition comprises: 60 parts of Mowiol 8-88, 40 parts of Mowiol 15-79, 10 parts of Ludox® CL; 3 parts of Agefloc WT35-VLV, 1.5 parts of boric acid, and 1.0 part of Cartabond TSI;

(B) Composition comprises: 60 parts of Mowiol 8-88, 40 parts of Mowiol 15-79, 10 parts of Ludox® CL; 1.5 parts of boric acid, and 1.0 part of Cartabond TSI ;

(C) Composition comprises: 60 parts of Mowiol 8-88, 40 parts of Mowiol 15-79, 10 parts of Ludox® CL; 3 parts of Catafix TSF, 1.5 parts of boric acid, and 1.0 part of Cartabond TSI; and

(D) Composition comprises: 60 parts of Mowiol 8-88, 40 parts of Mowiol 15-79, 10 parts of Ludox® CL; 5 parts of Agefloc WT35-VLV, 2.0 parts of boric acid.

Table I

Name	Gamut CIELab Volumes	K_{od}	Gloss/Haze uniformity	Humid bleed (µ) worst color	Humid bleed (µ) k halo	Humid color shift (ΔE94)
HP Premium Plus Glossy Paper	410,000-430,000	2.13-2.24	Poor to average	251	155	4.8
HP Everyday Photo Paper	380,000-390,000	1.83	Good	455	323	5.1
Jet Print PRO	386,724	1.73	Good	762	384	4.4
HP Brochure and Flyer	323,103	1.72	Average	488	424	3
A	439,968	2.04	Good	165	84	2.9
B	471,740	2.38	Good	152	79	2.3
C	456,228	2.4	Good	165	74	1.6
D	446,709	2.5	Good	150	53	3.8

See applicants' specification for other compositions in accordance with the claimed invention, and their test results.

9. As shown in the table above, the claimed exemplary coating compositions A, B, C and D, using the claimed ink-receiving layer in combination with the claimed paper base, show superior color space as illustrated in the first column of the Table by CIELab volumes. The superior color space of the print image on the inventive medium is better than the HP Premium Plus Glossy Paper, shown for comparison in the first row of Table I. Print medium in accordance with the claimed invention show a higher CIELab volume than commercially available coated paper bases or photo bases. The inventive print medium further enhances the density of black ink, as shown by the higher values of "K_{od}", illustrated in the 2^{nd} column of the Table, and improves image permanence.

10. These improved image properties using the inventive print medium are unexpected, especially in light of prior art teachings that photo base paper that has a high coat weight of the ink receiving layer is required to obtain high quality images using an inkjet printer.

11. Because the photo base paper that the prior art teaches to obtain high quality images is structurally different from the inventive paper base print medium, and in particular, includes an ink receiving layer with a coatweight in the range of 25-40 grams, there is no reason to believe that one of ordinary skill in the art would expect a coated paper base with a coatweight for the claimed ink receiving layer in the 3 – 7 grams per square meter range, to result in high quality print images. Rather, one or ordinary skill in the art would expect that reducing the coat weight of the ink receiving layer would result in a deterioration of image quality. Thus, it is simply not possible to extrapolate from the photo base paper taught in the prior art to the claimed composition with its claimed paper base and claimed ink receiving layer in the 3 – 7 grams per square meter range, in the context of the claim as a whole.

12. Accordingly, based on the above analysis and data, it is my strong opinion that the claims are not-obvious to one of ordinary skill in this art.

13. Finally, I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application of any patent issuing thereon.

Respectfully submitted,

Date June 18, 2009

By Tienteh Chen

Tienteh Chen

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OBJECTIVE:

A challenging R&D position in the fields of organic/polymer/colloid chemistry.

MAJOR ACCOMPLISHMENTS

- 45 granted US patents 23 pending patent applications
- Developed three new inkjet media products for HP
- Extensive experience in the design and synthesis of organic/inorganic particles with controlled surface properties and functional groups.
- Extensive experience in the design and synthesis of water soluble polymers, water dispersible polymers, polymer latex, and polymer particles.
- Extensive experience in the synthesis of functional monomers (UV absorbers, dye, couplers, scavengers, activators, crosslinkers, etc.).
- Extensive experience in the synthesis of ultrafine polymer latexes from solid vinyl monomers. Prepared latexes with excellent barrier(gas, oil) properties.
- Invented novel process to treat inorganic particles with silane coupling agents in water
- Experience in the loading of organic compounds into polymer latex
- Extensive experience in the dispersion of fumed silica, fumed alumina, and boehmite in water
- Synthesis of novel amphiphilic graft and block copolymers as pigment ink dispersants.
- Synthesis of core-shell particles with inorganic core and polymeric shell for inkjet applications.
- Modification of colloidal inorganic particles via sol-gel chemistry to introduce various functional groups at the interface.
- Invented process of making self-dispersible acrylate polymers containing various functional groups.
- Loading of photographically useful compounds, such as dye, stabilizers, UV absorbers, into polymer latexes. Prepared core-shell hollow particles.
- Synthesized surface active 2-oxazoline block copolymers as water-in-oil or oil-in-water emulsifiers.
- Invented a process of making ultrafine vinyl acetate latex as primer.

EDUCATION

Ph.D. , Polymer/Colloid Chemistry — August 1983
Institute of Materials Science
University of Connecticut, Storrs, CT.
Advisor: Prof. Robert M. Fitch
*Thesis Titles: **I.** Preparation and Characterization of Model Polystyrene Latexes with Thiosulfate Surface Groups. **II.** Photolysis of Water by Visible Light: Effects of Alkyl Viologens, Colloidal Silica , and Polyelectrolytes on the Efficiency of Hydrogen Production from Water*

M.S., Organic Chemistry — June 1979
University of Illinois at Chicago, Chicago, Ill.
Advisor: Prof. Joseph H. Boyer
Research Project: Synthesis of Hexanitrobenzene

B.S., Chemistry June 1974
National Taiwan University, Taipei, Taiwan.
Advisor: Prof. Yau-Tang Lin
Research Project: Natural Products Analysis of Chinese Medicine

EXPERIENCES

May 2001 to present **Project Leader and Program Manager, Inkjet Media R&D, Hewlett Packard Company, San Diego, CA .**

- Technical leader for the development of premium porous inkjet photo media for the pigment ink and dye based ink.
- Coordinated team members from R&D, manufacturing, product delivery, converting, planning, finance and marketing.
- Invented novel process to modify the surface of inorganic oxides with organic silane coupling agents in water.
- Performed pilot and production coatings of multilayered inkjet photo media with multilayered curtain coating and cascade coating technology.
- Developed a top layer formulation to improve the gloss and scratch resistance of the porous inkjet photo media.
- Developed a heat fusible photo media with superior image quality and durability comprising hollow polymer particles as ink absorption layer.
- Developed a low-cost swellable (polymeric) inkjet photo media with superior image quality and permanence (light fade and humid fastness)

Mar.2000 to May 2001 **Director, Media R&D, SiPix Imaging Inc.,Milpitas, CA**

- Led development of high image quality color and monochrome heat developed thermal media.
- Developed novel process to encapsulate color leuco dyes and visible light sensitizers in polymer particles which have excellent release and barrier properties, and keeping stability.

Apr.1986 to Mar.2000 **Research Associate, Eastman Kodak Company, Rochester, NY**

- Synthesis of novel amphiphilic graft and block copolymers as pigment ink dispersants.
- Design and synthesis of organic/inorganic, organic/organic core-shell particles as fast drying porous ink jet receiver.
- Modification of colloidal inorganic particles with dye fixation functional groups at the interface with silane coupling chemistry.
- Modification of PVA by grafting and derivatization as inkjet recording materials.
- Modification of gelatin for inkjet recording materials.
- Design and synthesis of UV absorbing monomers and polymers (2-hydroxyphenyl benzotriazole, 2-hydroxybenzophenone, etc.).
- Design and synthesis of image-forming dye (or so-called coupler) monomers and polymers (acrylate and arylamide types). Photostabilization of photographic materials.
- Emulsion polymerization of solid functional monomers, which have very low water solubility.
- Design and synthesis of water dispersible and water-soluble polymers containing photographically useful groups(PUG) by solution polymerization.
- Synthesis of PUG containing monomers with various linkage groups to modify their physical properties.
- Design and synthesis of polymer addenda for the photographic materials.
- Loading of the organic compounds into the polymer latexes.
- Synthesis of core-shell latex with various surface groups.
- Synthesis of new hardeners and polymeric hardeners (crosslinkers) for

gelatin.

- Viscosity studies on the surfactant-gelatin and particle-gelatin interactions.
- Design of polymer latexes with very low gelatin-particle interactions. Stability studies of the polymer colloids.
- The use of polymer as addenda for the improvement of image dye stability.
- Design of polymer overcoat for the protection of photographic materials. Modifications of polymer latexes with attachment of gelatin on the particle surface.
- Structure-property relationship of polymer properties with compositions.
- Preparation of water-soluble polymers as addenda for the photographic materials.

Sep.1984 to Apr.1986 **Chemist I, The Glidden Company, Strongsville, OH**

- Preparation of ultrafine particle size polymer latexes (vinyl acetate, styrene-acrylic, and all acrylic) as interior primers.
- Development of high % solid vinyl acetate latexes as binders for the interior house paint.
- Development of high % solid all acrylic latexes for exterior house paint.

Sep.1983 to Sep. 1984 **Postdoctoral Fellow, Case Western Reserve University, Cleveland,OH**

Research Advisors: Profs. Morton Litt and Irvin Krieger

- Synthesis of 2-oxazoline monomers with different functional groups
- Synthesis and characterizations of living block copolymers via cationic polymerization of 2-oxazoline monomers.
- Preparation of low surface energy and surface-active block copolymers.
- Preparation of polystyrene foams with more than 95% void with surface-active block copolymer as stabilizers.
- Characterizations of the surface-active block copolymers by the contact angle and the critical micelle concentration(CMC) measurements.

Sep. 1982 to Sep. 1983 **Teaching Assistant, U. of Connecticut, Storrs, CT**

Responsible for the teaching and supervision of the experimental course on the polymer characterizations.

Sep.1976 to Aug.1977 **Research Associate, National Taiwan University, Taipei, Taiwan**

Research on the Analysis of Camphor Trees by Extraction and Gas Chromatography.

Sep.1974 to Aug. 1976 **Taiwanese Army**

TECHNICAL SKILLS Familiar with most analytical techniques in the fields of organic, polymer, and colloid and surface chemistry.

MEMBERSHIPS American Chemical Society- Division Members of Polymer Chemistry, Polymeric Materials and Engineering Science, Colloid and Interface Science, Society of Imaging Science and Technology

INTERESTS Singing, Music, Photography, and Travel

CITIZENSHIP US citizen

MARITAL STATUS Married with three children

REFERENCES Available upon request

Publications and Patents

1. Ink set and media for ink-jet printing **US7,533,980 (2009)**
2. Use and preparation of crosslinked polymer particles for inkjet recording materials. **US7,507,439 (2009)**
3. Surface modification of silica in an aqueous environment **US 7,435,450 (2008)**
4. Fused ink-jet image with high image quality, air fastness, and light stability **US7,441,886 (2008)**
5. Porous inkjet recording material **US20080008882 A1**
6. Stackable inkjet recording material **US20070275190 A1**
7. Porous inkjet recording material **US20060246239 A1**
8. Ink set and media for ink-jet printing **US20060181587 A1**
9. Porous inkjet printing substrate containing polymer-grafted mineral oxides **US20060093761 A1**
10. Ink-jet media with multiple porous media coating layers **US20060083871 A1**
11. Ink-jet media coatings including expoxy-functionalized inorganic particulates and amine-functionalized inorganic particulates **US20060083870 A1**
12. Fusible ink-jet recording materials containing hollow beads and ultrafine polymer particles **US20060045999 A1**
13. Porous inkjet recording material **US20060013971 A1**
14. Fusible inkjet media including solid plasticizer particles and methods of forming and using the fusible inkjet media **US20060038871 A1**
15. Use and preparation of crosslinked polymer particles for inkjet recording materials **US20050249896 A1**
16. Ink-jet recording medium for dye-or pigment-based ink-jet inks **US20050266181 A1**
17. Ink-jet recording medium for dye-or pigment-based ink-jet inks **US20050276936 A1**
18. Fusible inkjet recording materials containing hollow beads, system using the recording materials, and methods of using the recording materials **US20050287313 A1**
19. Fusible inkjet recording materials containing hollow beads, system using the recording materials, and methods of using the recording materials **US20050287311 A1**
20. System and a method for starch-based, slow-release oral dosage forms **US2005023697 A1**
21. Fused ink-jet image with high image quality, air fastness, and light stability **US20050174415 A1**
22. System and a method for forming a heat fusible microporous ink receptive coating **US20050191445 A1**
23. Surface modification of silica in an aqueous environment **US20050170109 A1**
24. Inkjet recording materials **US20050003113 A1**
25. Inkjet recording materials containing siloxane copolymer surfactants **US20050003112 A1**
26. Water soluble polymers as inkjet recording materials. **US 6,933,024 (2005)**
27. Imaging media containing heat developable photosensitive microcapsules. **US 6,740,465 (2004)**
28. Ink jet recording element. **US 6,677,008 (2004)**
29. Imaging media containing heat developable photosensitive microcapsules. **US20020155372A1.**
30. Ink jet recording element. **US20020155260A1.**
31. Ink jet printing method. **US20020150731A1.**
32. Ink jet printing method. **US20020149662A1.**
33. Inkjet Recording Element (Organic/Inorganic Core/Shell). **US 6,440,537 (2002).**
34. Water-Resistant Protective Overcoat for Image Recording Materials. **US 6,426,167 (2002).**
35. Inkjet Printing Method (Novel Mordant). **US 6,423,398 (2002).**
36. Inkjet Printing Method (Graft Copolymer As Pigment Ink Dispersants). **US 6,406,143 (2002).**
37. Inkjet Printing Method . **US 6,375,320(2002).**
38. Photocrosslinkable Latex Protective Overcoat for Imaging Elements. **US 6,352,805(2002).**
39. Loaded Latex Compositions with Dye and Stabilizer. **US 6,361,916(2002).**
40. Color Photographic Element Containing Speed-Improving Polymers. **US 6,316,177 (2002).**
41. Ink Jet Printing Method. **US 6,315,405(2001).**
42. Color Photographic Elements Containing Improved Polymeric Disulfonamidephenol for Scavenging Oxidized Developer. **US 6,255,045(2001).**
43. Protecting Layer For Image Recording Materials. **US 6,221,546(2001).**
44. Overcoat Materials as Protecting Layer For Image Recording Materials. **US 6,214,938 (2001).**
45. Polymer Latexes with Core-Shell Morphology. **US 6,203,973 (2001).**
46. Overcoat Materials as Protecting Layer for Image Recording Materials. **US 6,130,014(2001).**
47. Hydrophilic Colloid Composition. **US 5,958,660(1999)**
48. Protective Layer for Gelatin Based AGX Photographic Products. **US 5,952,130(1999).**
49. Silver Halide photographic Material Containing A Polymer With A Photographically Useful Group Which

Is Rendered Non-Diffusible By Cross-Linking. **US 5,932,404(1999).**
50. Photographic Elements Containing 3-Alkyl Group Substituted 2-Hydroxyphenylbenzotriazole UV Absorbing Polymers. **US 5,858,633(1999).**
51. Photographic Element Containing Ultraviolet Absorbing Polymer. **US 5,766,834(1998).**
52. Process For Synthesizing Latex Polymers From Solid Monomer Particles. **US 5,747,585(1998).**
53. Attachment of Gelatin Grafted Polymer Particles to Precipitated Silver Halide Grains. **US 5,741,633(1998).**
54. Emulsion Polymerization of Solid Vinyl Monomers Containing Photographically Useful Groups. **US 5,693,461(1997).**
55. 2-Hydroxyphenyl Benzotriazole Based UV Absorbing Polymers With Particular Substituents And Photographic Elements Containing Them. **US 5,674,670(1997).**
56. Photographic Elements Containing Directly Dispersible UV Absorbing Polymers and Method of Making Such Elements and Polymers. **US 5,620,838(1997).**
57. 2-Hydroxyphenyl Benzotriazole Based UV Absoring Polymers and Photographic Elements Containing Them. **US 5,610,000(1997).**
58. Atttachment of Gelatin-Grafted Polymer Particles To Pre-precipitated Silver Halide Grains. **US 5,543,283(1996).**
59. Gelatin-Grafted Polymer Particles As Peptizers For Silver Halide Emulsions. **US 5,503,972(1996).**
60. Methods of Forming Polymeric Couplers. **US 5,455,147(1995).**
61. Gelatin-Grafted Polymer Particles As Peptizers For Silver Halide Emulsions. **US 5,441,865(1995).**
62. Attachment of Gelatin-Grafted Polymer Particles To Pre-precipitated Silver Halide Grains. **US 5,399,480(1995).**
63. Photographic Elements Incorporating Polymeric US Absorbers. **US 5,384,235(1995).**
64. Method of Preparing Photographic Elements Incorporating Polymeric UV Absorbers Loaded with High-Boiling Organic Solvents. **US 5,372,922(1994).**
65. Color Photographic Materials Containing Polymeric Couplers. **US 5,360,710(1994).**
66. Polymeric Couplers For Heat Image Separation Systems. **US 5,354,642(1994).**
67. Microemulsion Polymerization – Process For Dispersing Photographically Useful Components. **US 5,234,807 (1993).**
68. Photographic Elements Having Sulfoxide Coupler Solvents and Addenda to Reduce Sensitizing Dye Stain. **US 5,192,646(1993).**
69. Photographic Elements Having Carbonamide Coupler Solvents And Addenda To Reduce Sensitizing Dye Stain. **US 5,188,926(1993).**
70. Magenta Dye Forming Coupler For Photographic Material. **US 5,100,772(1992).**
71. Visible light-Induced hydrogen Formation From Water by Various 1,1' –Dialkyl-4,4'-Bipyridinium Salts. *J. Molecular Catalysis,* 63,
72. The Preparation and Surface Chemistry of Polystyrene Colloids Stabilized by Thiosulfate Surface Groups. *J. Colloid and Interface Science,* 137 , No. 1, 163-169 (1990).
73. Small Particle Size Latex Based on Vinyl Acetate Polymers. **US 4,812,510 (1989).**
74. Photographic Material Containing A Novel Polymeric Dye-Forming Couplers. **US 4,804,620 (1989).**
75. Low Surface Energy Polymers and Surface-Active Block Polymers J. Colloid and Interface Science, 115, No.2, 312-329 **(1987).**
76. Low-Surface Energy Polymers and Surface Active Block Polymers. I. t-Butylphenyl Containing Polymers. J. Polymer Science: Part A: Polymer Chemistry ,24, 3407-3422**(1986).**